



UNIVERSITI PUTRA MALAYSIA

**EFFICIENCY MEASUREMENT OF MALAYSIA'S MARITIME
ENFORCEMENT AGENCIES USING DATA ENVELOPMENT
ANALYSIS**

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By

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EFFICIENCY MEASUREMENT OF MALAYSIA'S MARITIME ENFORCEMENT AGENCIES USING DATA ENVELOPMENT ANALYSIS

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The study is concerned with measuring the degree or amount of efficiency of Malaysia's maritime enforcement agencies in pursuing their objectives. The ideal approach in determining efficiency in non-profit organization is one which will deal with multiple inputs and outputs simultaneously. This study therefore, attempts to broaden the scope of evaluation for the efficiency of non-profit organization in that it takes account all outputs as well as inputs that are required and desirable for effectiveness and allows for simultaneous interaction in their measurement and evaluation.

The study addressed the problem of four maritime enforcement agencies that are managed sectorally and functioning independently of one another. Under this system, each agency is established to enforce law and regulations related to its establishment, develops its own organization, manpower and training structures, acquire facilities and assets to meet its own requirement, operate independent budget and financial system, and established its own working culture independent of other organisation. This system is inherent with many weaknesses such as duplication of responsibilities, lack of

coordination among enforcement agencies and lack of focus on the economic use of assets. Hence, these agencies are believed to be inefficient to the extent that their operational effectiveness is also affected.

The methodology to measure relative efficiency is the use of Data Envelopment Analysis (DEA). DEA is a technique for comparing efficiencies between units having multiple inputs and outputs. In other words, DEA is an optimisation method of mathematical programming to generalise the single-output/single input efficiency measure to the multiple outputs/multiple inputs case by constructing an efficiency ratio of a single “virtual” output to single “virtual” input. The relative efficiency of each unit is calculated by forming the ratio of a weighted sum of outputs to the weighted sum of inputs.

The study involves 22 units which comprised two units of the Royal Malaysian Navy, five units of the Marine Police, nine units of the Department of Fisheries and six units of the Royal Customs and Excise Department. Of the 22 units, 14 are located in the Peninsular Malaysia and the other eight are located in Labuan, Sabah and Sarawak. However, due to insufficient data, five units, namely one unit each of the Marine Police and the Department of Fisheries, and three units of the Royal Customs and Excise Department are excluded.

The study tended to rebut the earlier belief that maritime enforcement agencies are inefficient under sectoral management. Of the 17 units being studied, 11 units or 64.7 percent are found efficient and only six units or 35.3 percent are found inefficient.

However, the analysis also reveals three weaknesses. First, there are indication that these agencies are not performing effectively due to poor command, control and coordination among these agencies. In other words, units of these agencies are “doing things right” but not enough to “doing the right thing”. Second, the major sources of inefficiencies are due to excessive inputs and lower output. Third, sectoral management of maritime enforcement agencies is no longer suitable in environment where resources are becoming more scarce and increasing competition to replace manpower with technology.

The research finding contributed to a fund of knowledge about efficiency measurement of maritime enforcement agencies. With slight modifications, the method is adaptable to measure the efficiency of other related agencies such as units of the Malaysian Armed Forces and Royal Malaysian Police.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**PENGUKURAN KECEKAPAN RELATIF AGENSI PENGUATKUASA MARITIM
MALAYSIA MENGGUNAKAN “DATA ENVELOPMENT ANALYSIS”**

Oleh

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Kajian ini berkaitan dengan pengukuran efisiensi agensi penguatkuasaan maritim Malaysia. Maklumat efisiensi agensi tersebut akan menjadi kayu pengukur setakat mana keupayaan kesemua agensi tersebut melaksanakan tugas dan tanggungjawab yang telah diamanahkan. Pendekatan yang ideal dalam menentukan tahap efisiensi sesebuah organisasi awam ialah menggunakan input dan output yang berganda secara serentak.

Kajian ini dilakukan bagi mencari kepastian ke atas anggapan bahawa keempat-empat agensi penguatkuasa maritim adalah tidak efisien kerana kesemua agensi tersebut diuruskan secara sektoral dan berfungsi secara berasingan antara satu dengan yang lain. Dalam sistem sektoral seperti ini, setiap agensi ditubuhkan bagi menguatkuasakan undang-undang yang diwujudkan khusus untuk agensi tersebut tanpa mengambil kira peranan agensi lain yang sejenis dan melaksanakan peranan yang serupa. Dalam konteks ini, agensi tersebut akan membangunkan reka bentuk organisasi, sistem keanggotaan, latihan dan kewangannya mengikut acuan yang diperlukan. Oleh itu, sistem ini dikaitkan dengan pelbagai kelemahan seperti pelaksanaan tugas yang bertindih,

tahap koordinasi yang lemah dan penggunaan sumber secara tidak ekonomi. Segala kelemahan seperti ini telah memberi anggapan bahawa organisasi penguatkuasa maritim adalah tidak efisien sehingga menjejaskan keberkesanan pelaksanaan operasinya.

Dalam kajian ini, pengukuran tahap efisiensi dilakukan dengan menggunakan Data Envelopment Analysis (DEA). DEA ialah satu teknik untuk membuat perbandingan efisiensi antara unit yang mempunyai input dan output berganda secara “mathematical programming”. Dalam pengiraannya, efisiensi relatif diperolehi dalam bentuk kadar antara “weighted sum of outputs” dibahagi dengan “weighted sum of inputs”.

Dalam kajian ini, sebanyak 22 unit yang terdiri daripada dua unit Tentera Laut Diraja Malaysia, lima unit Polis Marin, sembilan unit Jabatan Perikanan dan enam unit Jabatan Kastam dan Eksais Diraja telah terlibat. Daripada jumlah ini, 14 unit terletak di Semenanjung Malaysia manakala 8 unit lagi berada di Labuan, Sabah dan Sarawak. Walaupun, 22 unit telah dibuat kajian, namun hanya 17 unit sahaja yang pengiraan tahap efisiensinya dapat dilakukan kerana lima unit yang lain tidak mempunyai data yang lengkap. Unit tersebut terdiri daripada setiap satu unit daripada Polis Marin dan Jabatan Perikanan dan tiga unit lagi daripada Jabatan Kastam dan Eksais Diraja.

Penemuan daripada kajian ini telah dapat menyangkal anggapan bahawa agensi penguatkuasaan maritim adalah tidak efisien. Sebaliknya, 11 daripada 17 unit atau 64.5 peratus daripadanya didapati efisien. Analisis selanjutnya telah mendedahkan tiga lagi kelemahan agensi penguatkuasaan maritim. Pertama, terdapat tanda bahawa agensi penguatkuasaan maritim telah tidak menyempurnakan tugas-tugasnya dengan berkesan

kerana kelemahan sistem perintah, kawalan dan koordinasi antara agensi yang berkenaan. Dengan lain perkataan, agensi-agensi tersebut telah melaksanakan tugas dengan betul (doing things right) tetapi kurang membuat tugas yang betul (doing the right thing). Kedua, punca utama yang menyebabkan enam unit tidak efisien ialah kerana penggunaan input yang berlebihan dan pengeluaran output yang sangat kurang. Ketiga, pengurusan agensi penguatkuasaan maritim secara sektoral sudah tidak sesuai lagi pada hari ini kerana sumber yang sedia ada semakin berkurangan dan kecenderungan menggantikan tenaga manusia dengan teknologi telah meningkat.

Hasil kajian ini telah memberi sumbangan kepada peningkatan ilmu pengetahuan dalam bidang pengukuran efisiensi agensi penguatkuasaan maritim. Selain daripada kegunaan untuk mengukur tahap efisiensi agensi-agensi tersebut, penemuan ini boleh disesuaikan untuk mengukur efisiensi perkhidmatan awam yang seumpamanya terutamanya untuk unit-unit dalam Angkatan Tentera Malaysia dan Polis Diraja Malaysia.

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I certify that an Examination Committee met on 7th February 2003 to conduct the final examination of Sutarji bin Haji Kasmin, on his Doctor of Philosophy thesis entitled "Efficiency Measurement of Malaysia's Maritime Enforcement Agencies Using Data Envelopment Analysis" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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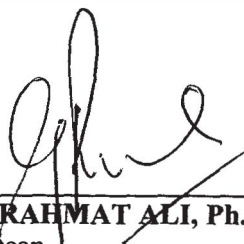
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DECLARATION

I hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



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TABLE OF CONTENTS

	Pages
ABSTRACT	ii
ABSTRAK	v
ACKNOWLEDGEMENTS	viii
APPROVAL	x
DECLARATION	xiii
TABLE OF CONTENTS	xiv
LIST OF TABLES	xxii
LIST OF FIGURES	xxviii
LIST OF ABBREVIATION	xxix

CHAPTER

I INTRODUCTION

Malaysia's Maritime Zones	1
The Importance of Malaysia's Maritime Zones	8
Related Marine and Coastal Issues in Malaysia's Maritime Zones	11
Management of Maritime Zones	21
Malaysia's Maritime Enforcement System	23
Royal Malaysian Navy	26
Marine Police	28
Marine Department	29
Royal Customs and Excise Department	29
Fisheries Department	30

Elements of Maritime Enforcement System	31
Fundamental of Maritime Enforcement Capabilities	35
Basis of Operational Capabilities of Maritime Enforcement Agencies	36
Maritime Areas of Responsibilities	38
Problem Statement	43
Performance Measurement Techniques	51
Objectives of This Study	53
Organization of this Study	54
2. LITERATURE REVIEW	
Introduction	57
Government Campaign to Improve Civil Service Quality	59
Total Quality Management	61
MS ISO 9000 : 2000	62
Performance Measurement Systems	64
Non-Frontier Approach to Efficiency Measurement	67
Cost Efficiency	69
Manpower Efficiency	69
Time Efficiency	70
Frontier Approach to Performance Measurement	70
Selection of Best Approach to Measure Efficiency	71
Comparison Between Parametric and Non-Parametric Techniques	72
Total Factor Productivity	72

Cost Benefit Analysis	74
Ratio Analysis	76
Engineering Approach	78
Econometric Approach	79
Stochastic Frontier Analysis	82
Regression Analysis	83
Mathematical Programming	85
Data Envelopment Analysis	87
Origin and Concept of DEA	89
DEA Mathematical Model	95
Weight and Its Restriction	100
DEA Properties and Characteristics	102
Performance Measurement in the Public Sector	104
Efficiency Measurement in the Maritime Enforcement Agencies	107
The Royal Malaysian Navy	108
Ships Combat Readiness Report	112
Work-up	113
Ships Operational Readiness Evaluation	113
Tactical Training	114
Exercises	115
Performance Target	116
Marine Police	117
Fisheries Department	119
Royal Customs and Excise Department	121

National Maritime Enforcement and Coordination Centre	I25
Efficiency Measurement in Selected Foreign Enforcement Agencies	I27
Australia's Maritime Enforcement Agencies	I28
The Canadian Coast Guard	I29
The Indian Coast Guard	I32
The Japan Coast Guard	I34
The Maritime and Coastguard Agency United Kingdom	I36
The United States Coast Guard	I40
Summary	I49
 3. MATERIALS AND METHODS	
Introduction	152
Selection of DMUs	153
Homogeneous Grouping	154
Size of Comparison Group	155
Availability of Data	155
Determining Initial List of Factors	157
Processes to Select the Initial List of Factors	158
Data Collection	161
Data Sources	162
Quantitative Data Collection	164
Data Collection From Official Documents	165

Comparison of Data From Ship's Records	167
Qualitative Data Collection Process	169
Validation of Data Collection Process	180
Data Random Checks	181
Verification of Data Recording Techniques	181
Certification of Ships' Records	184
Inputs and Outputs Data	184
Determining the Final List of Factors	188
Judgmental Screening	189
Selection of Inputs	190
Selection of Outputs	193
Non- DEA Quantitative Method	196
DEA- based Analysis	199
Application of DEA Model to Measure Efficiency	208
Selection of DEA Model	209
Selection of DEA Software	211
Efficiency Measurement Using Warwick – DEA Software	213
Summary	213
4. RESULTS AND ANALYSIS OF RESULTS	
Introduction	215
Results	217
Validation of the Results	219
Smith and Myston Validation Technique	220

“Jackknifing” Technique	225
Analysis of Results	227
Overall Efficiency of DMUs	228
Comparative Efficiency Index Scores of Individual Agency	229
Distribution of Relative Efficiency Spectrum	234
Performance of Relatively Efficient DMUs	236
What Aspects of Performance That Contributes To Efficiency Rating?	236
Does It Has Well Rounded Performance?	247
Can It Improves Efficiency Further?	247
Identification of Reference Set	248
Identification of Sources of Inefficiencies by Judgement	250
Royal Malaysian Navy	251
Marine Police	251
Department of Fisheries	253
Royal Customs and Excise Department	255
Target Setting of Inefficient DMUs	259
DMU 10 (GEWILA 3, Johor Bahru)	261
DMU 13 (GEWILA 6, Kota Kinabalu)	262
DMU 14 (GEWILA 7, Sitiawan)	263
DMU 21 (Royal Customs and Excise Department Sabah)	264
DMU 20 (Royal Customs and Excise Department Penang)	265
DMU 5 (Marine Police Southern Region, Johor Bahru)	266

Causes of Small Patrol Coverage	268
Relationship of DMUs' Efficiency Rating and the Presence Of Illegal Activities in AOR	271
Identification of Best Practices	273
The RMN's Inspector General	275
Ships' Operational Readiness State	276
Work-up and Inspection	276
Integrated Logistic System	277
"Built in Specialists"	277
Operationalisation of the Results	278
Improvement of Resources Utilisation	278
Reduction of Inputs and Increase of Outputs	279
Resources Relocation	280
Integrating Maritime Enforcement Agencies	281
Summary	283
5. INTEGRATED MARITIME ENFORCEMENT AGENCIES	
Introduction	286
Models of Integrated Maritime Enforcement Agencies	287
Proposed Model for Malaysia's Integrated Maritime Enforcement	288
Proposed Design of An Integrated Maritime Enforcement Agency	289
Selection of Suitable Integrated Maritime Enforcement Agency's Model for Malaysia	291
Summary	293

6. CONCLUSION, RECOMMENDATIONS AND FUTURE RESEARCH

Conclusion	295
Recommendations	300
Direction of Future Study	302
REFERENCES	A - 1
GLOSSARY OF TERMS	B – 1
VITA	C - 1

LIST OF TABLES

Tables		Page
1.1	Statistics on Fisheries Product 1995 to 1997	9
1.2	Malaysia's Oil and Gas Production 1995 to 2000	10
1.3	Sighting of Foreign Government Vessels in Malaysia's Waters	20
1.4	Ordinances and Acts Enforceable by the Maritime Enforcement Agencies	26
1.5	Size and Location of Maritime Enforcement Agencies' Regional Areas of Responsibility	41
1.6	Detection and Arrest of Foreign Fishing Vessels	49
1.7	Arrest of Indonesian Illegal Immigrants Entering Malaysia Illegally	50
1.8	Percentage of Arrest of Ships Discharging Oil Illegally	51
2.1	Allocation of RMN Ships	109
2.2	Allocation of Marine Police Boats to Regional Command	118
2.3	Allocation of Fisheries Vessels to GEWILA	120
2.4	Allocation of Marine Assets to States Royal Customs and Excise Department	124
2.5	Application of the US Coast Guard as Maritime Power	143
2.6	Application of the US Navy as Naval Power	144
2.7	Geographical Reach of the US Coast Guard Roles and Missions	146
2.8	Selected Criteria for Each Standard Goal	148
3.1	Initial List of Units Selected for Study	154

3.2	Initial Lists of Inputs	160
3.3	Initial List of Outputs	161
3.4	Details of Headquarters and Ships Visited During Data Collection	169
3.5	List of Decision Making Criteria	170
3.6	Five Levels of Weight Scale for Decision Making Criterion	171
3.7	Decision Making Criterion for Logistic Support	171
3.8	Decision Making Criterion for Administrative Support	172
3.9	Decision Making Criterion for Training Facilities	172
3.10	Levels of Nine-Point Sufficiency Rating Decision Criteria	173
3.11	Ratings of Each Decision Making Criterion for All DMUs for the Logistic Support	174
3.12	Ratings of Each Decision Making Criterion for All DMUs for the Administrative Support	175
3.13	Ratings of Each Decision Making Criterion for All DMUs for the Base Training Facilities	176
3.14	Total Sufficiency Score for the Logistic Support of Each DMU	177
3.15	Total Sufficiency Score for the Administrative Support of Each DMU	178
3.16	Total Sufficiency Score for the Training Facilities of Each DMU	179
3.17	Qualitative Inputs Values of Each DMU for the Logistic Support, Administrative Support and Base Training Facilities	180
3.18	Inputs and Outputs Data of Maritime Enforcement Agencies for 1995	185
3.19	Inputs and Outputs Data of Maritime Enforcement Agencies for	186

	1996	
3.20	Inputs and Outputs Data of Maritime Enforcement Agencies for 1997	187
3.21	Average Annual Data of Maritime Enforcement Agencies	188
3.22	Characteristic of Ships and Boats of Maritime Enforcement Agencies	193
3.23	Outcomes of the Correlation Tests	198
3.24	First Run. Measurement of EIS With All Inputs and Outputs Included	201
3.25	Second Run. Measurement of EIS With All Inputs and Outputs Except IP 3	202
3.26	Third Run. Measurement of EIS With All Inputs and Outputs Except OP 3	203
3.27	Outcomes of DEA-based Analysis for the Final Selection of Inputs/Outputs Factors	204
3.28	EIS of Maritime Enforcement Agencies Using 1995 Data	205
3.29	EIS of Maritime Enforcement Agencies Using 1996 Data	206
3.30	EIS of Maritime Enforcement Agencies Using 1997 Data	207
3.31	Comparison of EIS of Maritime Enforcement Agencies Based on Annual Data and Average Data	208
3.32	Interpretation of DEA Models	210
4.1	Final EIS of Maritime Enforcement Agencies	218
4.2	DMUs Sequence of Final EIS	219
4.3	Outcomes of First Stage of Validation Tests	221

4.4	Outcomes of Second Stage of Validation Tests	222
4.5	Outcomes of Third Stage of Validation Tests	223
4.6	Summary of EIS Based on the Three Stages of the Validation Tests	224
4.7	Summary of Validation Outcomes Using “Jackknifing” Technique	226
4.8	List of DMUs and their EIS	228
4.9	Relative Efficiencies of the Royal Malaysian Navy’s DMUs	229
4.10	Relative Efficiencies of the Royal Malaysian Police’s DMUs	230
4.11	Relative Efficiencies of the Department of Fisheries’ DMUs	231
4.12	Relative Efficiencies of the Royal Customs and Excise Department’s DMUs	232
4.13	Comparative EIS of All DMUs Analysed as a Group and DMUs Analysed Based on Individual Agency	233
4.14	Distributions of DMUs Over the Relative Efficiency Spectrum	234
4.15	Distributions of Efficiency Ranking of Maritime Enforcement Agencies	235
4.16	Virtual Inputs and Outputs of DMU 1 (Headquarters Naval Area 1 Kuantan)	238
4.17	Virtual Inputs and Outputs of DMU 2 (Headquarters Naval Region 2, Labuan)	238
4.18	Virtual Inputs and Outputs of DMU 3 (Marine Police North)	239
4.19	Virtual Inputs and Outputs of DMU 4 (Marine Police East)	240
4.20	Virtual Inputs and Outputs of DMU 6 (Marine Police Sabah)	241
4.21	Virtual Inputs and Outputs of DMU 8 (DOF GEWILA 1, Penang)	241